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Research Paper

Mental health and social support of caregivers of children and adolescents with ASD and other developmental disorders during COVID-19 pandemic

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ABSTRACT

Background: Previous studies showed that caregivers of children with autism spectrum disorder (ASD) and other developmental disorders had higher levels of parenting stress, anxiety and depression. In the present study, the author examined the caregivers' mental health and investigated the mediating role of social support between symptoms severity and parenting stress during COVID-19.

Methods: During 20 March to 8 April 2020, 1932 caregivers of children and adolescents with ASD and other developmental disorders from China were enrolled to fill in a sociodemographic questionnaire, Depression, Anxiety and Stress Scale and Social Support Rating Scale. The author also collected children's disability severity symptoms and behavioral problems.

Results: The results showed that 46.01% of the caregivers reported symptoms of depression, 44.67% showed anxiety and 44.62% showed stress during COVID-19 pandemic. Fathers were found to get more subjective support than mothers ($P < 0.05$). Caregivers who had the highest educational attainment had the most social support ($P = 0.01$). People who had the more household income showed the significantly lower levels of depression and anxiety ($P < 0.05$). The caregivers' employment status during COVID-19 was found significantly related with their depression, anxiety, stress and social support ($P < 0.05$).

Limitations: This study has some limitations, such as it did not conduct the longitudinal analysis of variables before COVID-19.

Conclusions: The findings showed that many caregivers experienced mental health problems during COVID-19. The author suggested to promote caregivers' engagement in functional social support and the behavioral interventions for their children to reduce the impact of stress, anxiety and depression.

1. Introduction

COVID-19 pandemic was reported having influenced on every aspect of our lives. According to (Wang et al., 2020) Wang et al (2020), "during the initial phase of the COVID-19 outbreak in China, more than half of the respondents rated psychological impact as moderate-to-severe, and about one-third reported moderate-to-severe anxiety". Wang and Zhao (2020) reviewed that people quite often reported the physical and psychological symptoms of stress, anxiety, or even depression and other emotional reactions during COVID-19 pandemic (Chen et al., 2020; Duan and Zhu, 2020; Wang et al., 2020; Wang et al., 2020; Xiang et al., 2020).

Autism spectrum disorder (ASD) is a neuro-developmental disorder characterized by social interaction deficits and restricted or repetitive patterns of behavior or interests (American Psychiatric Association, 2013), affecting about 1% of the population globally according to a review commissioned by WHO and later published in *Autism Research* (Elsabbagh et al., 2012) and 1.5% in developed countries which was a more recent estimates (Lyall et al., 2017). In addition, based on the data reported by USA Centers for Disease Control and Prevention (2020) (Centers for Disease Control and Prevention 2020) the prevalence of ASD in USA was 1 in 54, the highest since its first study in 1970s in USA. Many previous studies indicated that parents of children with developmental disorders, such as attention deficit hyperactivity disorder (ADHD) and ASD, showed a higher level of parenting stress and mental health problems (Cheung and Theule, 2016; Hayes and Watson, 2013; Schnabel et al., 2019; Theule et al., 2013; Karst and Van Hecke, 2012; Rivard, Terroux, Parent-Boursier, and Mercier, 2014; Martin et al., 2019), and poorer marital adjustment and family dynamics (Gardiner and Iarocci, 2015; Jellett, Wood, Giallo, & Seymour, 2015; Lee, 2009;

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Gau et al., 2012) than parents of typically developing (TD) children. These studies were mostly conducted in western or developed countries, however, studies also demonstrated that since the awareness of mental health including ASD was growing fast in the past decade in the Asian areas, there have been more studies showing the high parenting stress and mental health difficulties of caregivers (Hayes and Watson, 2013; Ilias et al., 2016; Ilias et al., 2018; Wang, Hu and Han, 2020).

The COVID-19 outbreak and quarantine brought new challenges for the caregivers, however, there was not any research on the mental health difficulties of caregivers of children with ASD and other neurodevelopmental disorders during COVID-19. How were the levels of their psychological wellbeing/distress during COVID-19 pandemic? And what were the factors accounted for? Some variables such as levels and sources of social support (such as from family members, neighbors, professionals, schools, etc.), severity of ASD symptoms, financial status, etc. have been found to be significantly related in coping with parenting stress in caregivers of children with ASD (Ilias et al., 2018; Tehee et al., 2009; Ekas et al., 2010; Lovell et al., 2012; Weiss et al., 2013; Mackintosh et al., 2012; Vohra et al., 2014).

According to the Stay At Home order towards COVID-19 around the world, all children and adolescents had to stay at home and could not follow their usual daily routines of going to schools or service centers for intervention, though some of them then received home therapy by caregivers or via online courses, but others might receive no therapy through the pandemic. How these affected the mental health of their caregivers? What kind of social support did the caregivers obtain towards these?

The current study aims to examine the mental health of caregivers of young children and adolescents with ASD and other developmental disorders in China, and to investigate the mediating role of social support between their children and parenting depression, anxiety and stress during COVID-19 pandemic. China reported the first confirmed case of COVID-19 and was also the first one had quarantine policy for its residents. The current study collected data for the whole quarantine period since late January till when COVID-19 pandemic started to explode in western countries in March/April, hence, was also the first one to focus on this topic. The author hypothesized that caregivers' mental health problems would be lower in those with higher levels and more sources of social support during COVID-19.

2. Methods

2.1. Participants

1932 caregivers (207 father, 1680 mother and 45 other caregivers) of young children with ASD and other developmental disorders from 31 provincial-level administrative units in China were enrolled to fill in a sociodemographic questionnaire, Depression, Anxiety and Stress Scale (DASS21, Lovibond and Lovibond, 1995) and Social Support Rating Scale (SSRS, Xiao, 1993) during 20 March to 8 April, 2020 (see Table 1). Their children or adolescents were aged between 1 to 17 (Mean = 7.30, SD = 3.56) including 1529 males and 403 females, of whom 70.91% were diagnosed with ASD, 13.25% had ADHD, 36.80% had language delay, 35.27% had intelligent disabilities and 6.99% had other developmental disorders. The disability severity symptoms and behavioral problems were also collected.

2.2. Measures

The questionnaire consisted of the following items: a sociodemographic questionnaire about the parent/caregiver and the child with ASD or other developmental disorders, a measure of parent depression, anxiety and stress (the Depression, Anxiety and Stress Scale) and their social support (Social Support Rating Scale) during the pandemic. Sociodemographic questionnaire included their relationship to the child, their age, their gender, their marital status, their educational background, their profession, their household income, their employment status during COVID-19, their knowledge of COVID-19, if family members have been confirmed cases of COVID-19, and children's age, gender, sleeping status, intervention model, frequency and effectiveness, child-parent interaction during COVID-19 pandemic, etc.

2.2.1. Depression, anxiety and stress scale

Depression, Anxiety and Stress Scale (DASS21, Lovibond and Lovibond, 1995) was used to assess the mental health of caregivers of children and adolescents with ASD. DASS21 was designed to measure people's psychological distress and this parameter characterized as depression, anxiety and stress. The calculations of scores were based on Le (2019). The total depression/anxiety/stress subscale score were divided into normal, mild, moderate, severe and extremely severe. Higher scores means high levels of mental problems. The DASS21 has been used widely in the Chinese population and showed a high reliability and validity (Ho, 2019; Quek, 2018).

2.2.2. Social support rating scale

Social Support Rating Scale (SSRS, Xiao, 1993) was used to measure the social support of caregivers in this study. SSRS has been used by wide range of Chinese populations and showed high reliability and validity Xu and Wei (2013). The 10 items, each scored on a 4-point Likert scale, were allocated to three subscales: subjective support, objective support and support availability. The total score was 40. The total scores above 20 were regarded as normal. The higher the scores were, the higher the social support was. Its internal consistency was reported as satisfactory ($\alpha > 0.91$).

2.3. Procedure

An online survey was used for data collection. The participants were recruited from service centers around China. They all registered in a national registry network organized by the China Association of Persons with Psychiatric Disability and their Relatives (CAPPDR). Members of service centers of CAPPDR from all over China invited the caregivers to attend in our study. Participation of this study was voluntary. The participants were first provided a recruitment flyer of the inclusion criteria which consisted (a) being a caregiver of at least one child or adolescent with ASD or other developmental disorders, (b) living in China during COVID-19 pandemic that is during 20 January to 20 March, (c) understanding written Chinese. And then the participants could chose to continue the study or not. If they chose "Yes, continue" and then they were provided the introduction of the study and informed consent. After consenting, they started to take part in the survey which took approximately 15–20 min to finish. Participants were not given any kinds of awards, cash or gift cards, but only sincere thankfulness for participation. Ethics and informed consent were both in accordance with the related regulations of the author's university.

2.4. Statistical analysis

SPSS22.0 was used to conduct the statistical analysis, such as the descriptive statistics means and standard deviations (SD). The two-sample t-test was used to calculate and analyze the relationship between caregivers' age, gender, marital status, educational attainment, household income, employment, etc., and their mental health status and social support conditions. The bivariate associations between the variables were examined by Pearson correlations. The regression analyses were used separately among several groups to test the potential moderators. If the resulting p-value was smaller than 0.05, an effect was considered significant.

Table 1
Association between demographic variables and the mental health status and social support of caregivers of children and adolescents of ASD during COVID-19 pandemic.

Variables	N(%)	Depression		Anxiety		Stress		Social Support	
		Mean(SD)	*P*	Mean(SD)	*P*	Mean(SD)	*P*	Mean(SD)	*P*
Parent									
Mother	1680(86.96)	10.46(9.96)		8.36(8.59)		11.11(9.36)		36.56(8.12)	
Father	207(10.71)	9.77(8.87)		7.96(7.75)		11.12(9.05)		37.25(8.61)	
Others	45(2.33)	10.09(10.45)		8.62(8.48)		11.02(9.55)		38.2(8.61)	
Subtotal	1932(100)	10.37(9.86)	0.63	8.32(8.5)	0.80	11.11(9.33)	1.00	36.67(8.19)	0.23
Gender of Children									
Males	1529(79.14)	10.18(9.82)	0.74	8.23(8.55)	0.82	10.99(9.32)	0.85	36.72(8.20)	0.92
Females	403(20.86)	11.1(9.98)		8.67(8.29)		11.55(9.36)		36.46(8.15)	
Age of Children (Years)									
1~6	945(48.91)	10.42(9.93)		8.32(8.55)		11.1(9.38)		36.83(7.95)	
7~12	74038.30)	10.5(9.63)		8.52(8.43)		11.33(9.24)		36.66(8.49)	
13~17	247(12.79)	9.82(10.27)		7.72(8.55)		10.47(9.42)		36.09(8.19)	
Subtotal	1932(100)	10.37(9.86)	0.63	8.32(8.5)	0.45	11.11(9.33)	0.46	36.67(8.19)	0.45
Marital Status									
Single	7(0.36)	10.26(9.76)		8.23(8.46)		10.96(9.25)		37.07(8.10)	
Married	1772(91.72)	8.57(10.57)		8(9.73)		10(9.87)		33.29(9.81)	
Divorced	101(5.23)	11.35(11.15)		9.05(9.16)		12.46(10.5)		32.13(7.96)	
Separated	25(1.29)	10.4(9.52)		8.32(6.80)		11.76(8.95)		32.6(8.52)	
Widowed	17(0.88)	13.88(10.23)		10.24(7.77)		14.82(8.06)		32.47(6.14)	
Others	10(0.52)	16.6(11.85)		14(11.35)		17.2(10.96)		31.1(8.45)	
Subtotal	1932(100)	10.37(9.86)	0.18	8.32(8.5)	0.28	11.11(9.33)	0.08	36.67(8.19)	0.00
Employment Status during COVID-19									
Work from home	175(9.06)	10.69(10.16)		8.81(8.73)		11.34(9.61)		39.29(8.02)	
Not working	1370(70.91)	10.69(10.04)		8.53(8.74)		11.4(9.5)		35.88(8.14)	
Work at office	387(20.03)	9.11(8.93)		7.35(7.41)		9.98(8.48)		38.26(7.99)	
Subtotal	1932(100)	10.37(9.86)	0.02	8.32(8.5)	0.04	11.11(9.33)	0.03	36.67(8.19)	0.00
Have income during COVID-19									
Yes	709(36.70)	9.88(9.56)	0.11	7.83(8.07)	0.04	10.49(8.93)	0.04	38.04(8.02)	0.47
NO	1223(63.30)	10.66(10.02)		8.6(8.73)		11.47(9.54)		35.87(8.18)	
Have family members affected by COVID-19									
Yes	92(4.76)	12.28(9.84)	0.95	9.89(8.33)	0.83	12.98(9.58)	0.98	35.26(8.37)	0.69
No	1840(95.24)	10.25(9.85)		8.22(8.46)		10.98(9.26)		36.95(8.16)	
Live in Hubei									
Yes	56(2.90)	12.04(10.18)	0.8	9.36(8.3)	0.93	12.75(9.11)	0.99	34.07(7.5)	0.77
No	1876(97.10)	10.32(9.85)		8.29(8.51)		11.06(9.33)		36.75(8.2)	
Knowledge of COVID-19									
Fear									
Very low	48(2.48)	8.83(10.49)		6.17(7.41)		9.29(9.78)		38.17(9.17)	
Low	106(5.49)	9.7(10.02)		7.74(8.3)		10.57(9.44)		36.7(8.1)	
Average	523(27.07)	9.45(9.45)		7.51(7.98)		10.09(8.87)		37.27(7.99)	
High	737(38.15)	10.42(9.15)		8.22(7.77)		11.24(8.73)		36.47(8.09)	
Very high	518(26.81)	11.53(10.99)		9.61(9.89)		12.23(10.38)		36.2(8.44)	
Subtotal	1932(100)	10.37(9.86)	0.01	8.32(8.5)	0.00	11.11(9.33)	0.00	36.67(8.19)	0.16
Impact on children									
Nothing	242(12.53)	9.36(9.56)		7.38(7.86)		9.76(8.77)		38.11(8.44)	
Some	1042(53.93)	9.57(9.31)		7.79(8.2)		10.6(9.03)		37.05(8.00)	
A lot	648(33.54)	12.04(10.6)		9.53(9.07)		12.43(9.85)		35.51(8.27)	
Subtotal	1932(100)	10.37(9.86)	0.00	8.32(8.5)	0.00	11.11(9.33)	0.00	36.67(8.19)	0.00
Children's maintenance of skills									
Yes	1354(70.08)	9.84(9.66)	0.01	7.83(8.21)	0.00	10.59(9.15)	0.03	37.68(8.09)	0.34
No	578(29.92)	11.62(10.2)		9.48(9.06)		12.31(9.63)		34.29(7.94)	
Children's acquisition of new skills									
Yes	1306(67.60)	10.09(9.61)	0.05	8.13(8.36)	0.18	10.87(9.22)	0.2	37.62(8.12)	0.36
No	626(32.40)	10.96(10.34)		8.71(8.78)		11.61(9.54)		34.68(7.98)	
Effectiveness of home intervention									
Nothing	101(5.23)	12.08(11.24)		9.27(9.09)		12.55(10.32)		33.01(7.38)	
A little	1442(74.64)	10.6(9.86)		8.49(8.56)		11.27(9.33)		36.67(8.00)	
Significant	216(11.18)	7.84(9.13)		6.53(7.58)		9.13(8.82)		40.19(8.13)	
Not applicable	173(8.95)	10.62(9.44)		8.57(8.56)		11.36(9.1)		34.43(8.59)	
Subtotal	1932(100)	10.37(9.86)	0.00	8.32(8.5)	0.01	11.11(9.33)	0.01	36.67(8.19)	0.00
Child-parent interaction during COVID-19									
Less	74(3.83)	11.16(10.83)		9.24(9.56)		12.08(9.69)		32.86(8.65)	
A little less	109(5.64)	10.55(9.91)		8.29(8.38)		11.1(9.47)		33.85(8.42)	
Average	579(29.97)	10.78(10.03)		8.69(8.59)		11.28(9.55)		35.34(7.76)	
A little more	613(31.73)	10.53(9.63)		8.51(8.3)		11.48(9.06)		36.94(7.7)	
More	557(28.83)	9.65(9.77)		7.61(8.49)		10.39(9.29)		38.81(8.46)	
Subtotal	1932(100)	10.37(9.86)	0.33	8.32(8.5)	0.19	11.11(9.33)	0.26	36.67(8.19)	0.00
Attention to child's mental health									
Same as before	586(30.33)	9.87(10.08)		7.48(8.41)		10.23(9.4)		36.16(8.09)	
More	419(21.69)	9.68(9.21)		7.64(7.85)		10.21(8.58)		36.74(7.82)	
Very much	564(29.19)	10.13(9.35)		8.4(8.08)		10.95(8.83)		38.15(8.37)	
A little bit worried	179(9.27)	11.4(9.51)		9.62(8.51)		12.91(9.33)		35.41(7.78)	
Worried very much	184(9.52)	13.29(11.76)		11.03(10.58)		14.68(11.09)		34.82(8.49)	
Subtotal	1932(100)	10.37(9.86)	0.00	8.32(8.5)	0.00	11.11(9.33)	0.00	36.67(8.19)	0.00

3. Results

3.1. Correlations among sociodemographic variables and caregivers' mental health and social support

As shown in Table 1, their marital status, educational background and household income were all significantly associated with their social support, such as caregivers in marriage obtained more social support than those who were divorced ($P \leq .001$), separated or widowed; caregivers who owned highest degree for instance Masters or doctorate degrees had the most social support ($P = 0.01$); the more their household income was, the more their social support was ($P \leq .001$). Besides, their depression ($P < 0.05$) and anxiety ($P \leq .001$) were significantly related with household income but not their stress ($P = 0.06$). Their employment status during COVID-19 was found significantly related with their depression, anxiety, stress and social support: people who worked from home during COVID-19 showed the highest level of depression, anxiety, stress ($P < 0.05$) and social support ($P \leq .001$) than those who were not working or worked at office.People who had the highest level of fear of COVID-19 had the highest level of depression ($P = 0.01$), anxiety ($P \leq .001$) and stress ($P \leq .001$), and were not affected by their social support ($P = 0.16$). The result also showed that caregivers whose children were affected most by COVID-19 had the highest levels of depression, anxiety and stress ($P \leq .001$) and the lowest social support ($P \leq .001$). And caregivers who found home intervention not effective had the highest scores on DASS21 ($P \leq .001$) and those who obtained the most social support found home intervention significantly effective ($P \leq .001$). The child-parent interaction during COVID-19 was found not significantly correlated with mental health of caregivers ($P > 0.05$) but social support ($P \leq .001$), that is, the family which had the most child-parent interaction got the most social support. Attention to child's mental/physical health was significantly associated with the mental health and social support of caregivers ($P \leq .001$), that is, those caregivers who worries their child's mental/physical health most had the highest scores on DASS21 ($P \leq .001$) and those who paid very much attention to the mental/physical health of their child got the highest scores on social support ($P \leq .001$).

Table 2 demonstrated the hierarchical linear regression analysis of social support as independent variable correlated to depression, anxiety and stress as the dependent variables and 3 showed the hierarchical linear regression analysis of independent variables correlated to anxiety, depression, stress and social support in caregivers. COVID-19 significantly affected the mental health of caregivers and social support was a effective mediating variable. "Employment status during COVID-19" was associated with parental depression ($\beta = -.054$, $P = .022$), stress ($\beta = -.050$, $P = .031$) and anxiety ($\beta = -.054$, $P = .021$). Children's maintenance of skills were significant predictor of parental depression ($\beta = -.052$, $P = .047$), stress ($\beta = -.055$, $P = .034$), anxiety ($\beta = -.068$, $P = .009$) and social support ($\beta = -.095$, $P = .000$) .

3.2. Status and severity of depression, anxiety and stress

The results indicated that caregivers' depression (Mean = 10.37, SD = 9.86, $P = 0.63$), anxiety (Mean = 8.32, SD = 8.5, $P = 0.80$) and stress (Mean = 11.11, SD = 9.33, $P = 1.00$) were not significantly different among them ($P > 0.05$). Table 4 showed the score distribution of DASS21 by severity. There were 46.86% of fathers having different levels of depression, 46.38% having anxiety and 43.38% having stress. 46.07% of mothers had different levels of depression, 44.46% having anxiety and 44.88% having stress. Among all the caregivers, 46.01% showed depression, 44.67% anxiety and 44.62% stress (see Table 3). Table 5 demonstrated the status of depression, anxiety and stress among caregivers of children and adolescents with ASD and other developmental disorders. Among caregivers who lived in Hubei province during COVID-19 pandemic, 51.79% had depression, 50% had anxiety and stress, however, for those who lived outside Hubei province, 45.84% showed symptoms of depression, 44.51% had anxiety and 44.45% had stress.

Table 2
Hierarchical linear regression analysis of social support as independent variable correlated to depression, anxiety and stress as dependent variables

	R^2	B	β	t	p
Anxiety	.026	-.168	-.162	-7.201	.000
Depression	.043	-.249	-.207	-9.277	.000
Stress	.031	-.201	-.176	-7.858	.000

3.3. Status of social support

The total social support among caregivers was not significantly different (Mean = 36.6, SD = 8.19, $P = 0.23$), but differences were found in the subscales, such as on subjective support (Mean = 21.39, SD = 5.48, $P < 0.05$) and support availability (Mean = 6.96, SD = 1.92, $P = 0.007$), but not on objective support (Mean = 8.32, SD = 2.81, $P = 0.42$). The results showed that fathers got more subjective support than mothers and others had more support availability than either mothers or fathers.

3.4. Sleeping status and other impact of COVID-19

It was reported by the caregivers that 1484 (76.81%) children and adolescents had normal sleep during COVID-19, and 222 (11.49%) found difficult to fall asleep, 120 (6.21) woke early, 256 (13.25%) had longer or shorter sleep, 21 (1.09%) often had dreams ad 120 (6.21%) were easy to wake up and hard to sleep again as shown in Fig. 1. Fig. 2 demonstrated the general impact of COVID-19 on children and adolescents with ASD and other developmental disorders (none, some and a lot) and the related depression, anxiety, stress and social support of their caregivers. It showed that the less impact on children and adolescents of COVID-19, the lower score their caregivers would have on depression, anxiety and stress and higher score on social support. It is consistent with our hypothesis that the mental health of caregivers of children and adolescents with ASD and other developmental disorders in China is closely associated with the health of their children, and the mediating role of social support in their parenting depression, anxiety and stress during COVID-19 pandemic.

4. Discussion

4.1. Caregivers' mental health and social support

Having a ASD child is a lifelong challenging activity and definitely aroused higher stress on caregivers, esp. during the COVID-19 pandemic. In alignment with the previous studies, the results showed that raising a ASD child was closely associated with an increased risk for mental health problems, such as, Salomone et al (2018) reported that 48% of caregivers of children with ASD had mental health problems and Goldberg et al (1997) found that 24% in the general population. Herrema et al (2017) found that the 60 % of caregivers or family members of ASD adults met the cutoff of depression (Mean = 12.63, SD = 5.36), 73% anxiety (Mean = 11.03, SD = 4.41) and 47% stress (Mean = 14.80, SD = 5.04) for DASS21 scales. In the current study the percentages were different but the findings confirmed previous studies.

Compared to the caregivers of TD children, caregivers of ASD children have been reported to show higher levels of anxiety and depression (Karst and Van Hecke, 2012). During COVID-19, for example, caregivers of ASD and other developmental disorders should pay attention to not only their child's mental and physical health and general impact, but also their child's maintenance of new skills, appearance of new problem behaviors, feasibility of online intervention or courses and new plan for home intervention, etc., all of which would in turn increase the

Table 3
Hierarchical linear regression analysis of independent variables correlated to anxiety, depression, stress and social support in caregivers.

	Depression		Stress		Anxiety		Social Support	
	β	*p*	β	*p*	β	*p*	β	*p*
Parent	.001	.973	-.015	.525	.000	.988	-.015	.497
Age	.027	.307	.029	.267	.026	.332	.000	.992
Gender of children	.033	.147	.021	.359	.017	.450	.001	.946
Age of children	-.003	.905	-.008	.762	.001	.971	.003	.919
Marital Status	.036	.115	.050	**.028**	.027	.234	-.132	**.000**
Employment Status during COVID-19	-.054	**.022**	-.050	**.031**	-.054	**.021**	.022	.323
Live in Hubei during pandemic	-.033	.151	-.037	.107	-.027	.241	.047	**.028**
Effectiveness of home intervention	-.032	.175	-.023	.320	-.019	.424	.023	.297
Effectiveness of online courses	.006	.860	.038	.267	.048	.153	.045	.159
Child-parent interaction during COVID-19	-.032	.195	-.031	.206	-.043	.081	.153	**.000**
Attention to child's mental health	.018	.641	.083	**.028**	.057	.132	-.035	.332
R^2	.036		.042		.041		.141	

Bold $=P < 0.05$

Table 4
Score distribution of the 21-item Depression, Anxiety, and Stress Scale by severity.

			Father	Mother	Others	Subtotal	Live in Hubei	Not Live in Hubei
Depression	0-9	Normal	110 (53.14%)	906 (53.93%)	27 (60%)	1043 (53.99%)	27 (48.21%)	1016 (54.16%)
	10-12	Mild	41 (19.81%)	243 (14.46%)	5 (11.11%)	289 (14.96%)	9 (16.07%)	280 (14.92%)
	13-20	Moderate	34 (16.43%)	276 (16.43%)	6 (13.33%)	316 (16.35%)	8 (14.29%)	308 (16.42%)
	21-27	Severe	8 (3.86%)	120 (7.14%)	2 (4.45%)	130 (6.73%)	8 (14.29%)	122 (6.50%)
	28-42	Extremely Severe	14 (6.76%)	135 (8.04%)	5 (11.11%)	154 (7.97%)	4 (7.14%)	150 (8%)
Anxiety	0-6	Normal	111 (53.62%)	933 (55.54%)	25 (55.56%)	1069 (55.33%)	28 (50%)	1041 (55.49%)
	7-9	Mild	29 (14.01%)	157 (9.35%)	6 (13.33%)	192 (9.94%)	3 (5.36%)	189 (10.07%)
	10-14	Moderate	40 (19.32%)	306 (18.21%)	4 (8.89%)	350 (18.12%)	12 (21.43%)	338 (18.02%)
	15-19	Severe	6 (2.9%)	78 (4.64%)	3 (6.67%)	87 (4.50%)	6 (10.71%)	81 (4.32%)
	20-42	Extremely Severe	21 (10.15%)	206 (12.26%)	7 (15.55%)	234 (12.11%)	7 (12.50%)	227 (12.10%)
Stress	0-10	Normal	117 (56.52%)	926 (55.12%)	27 (60%)	1070 (55.38%)	28 (50%)	1042 (55.54%)
	11-18	Mild	55 (26.57%)	467 (27.80%)	9 (20%)	531 (27.49%)	16 (28.57%)	515 (27.45%)
	19-26	Moderate	18 (8.70%)	156 (9.28%)	4 (8.89%)	178 (9.21%)	7 (12.50%)	171 (9.12%)
	27-34	Severe	15 (7.25%)	85 (5.06%)	4 (8.89%)	104 (5.38%)	4 (7.14%)	100 (5.33%)
	35-42	Extremely Severe	2 (0.96%)	46 (2.74%)	1 (2.22%)	49 (2.54%)	1 (1.79%)	48 (2.56%)
Total			207 (10.71%)	1680 (86.96%)	45 (2.33%)	1932 (100%)	56 (2.90%)	1876 (97.10%)

Table 5
Status of depression, anxiety and stress among caregivers of children and adolescents with ASD and other developmental disorders .

	Depression	Anxiety	Stress
No	1043 (53.99%)	1069 (55.33%)	1070 (55.38%)
Yes	889 (46.01%)	863 (44.67%)	862 (44.62%)

caregivers' mental health problems.

The results also suggested social support as a coping mechanism or a mediating role between their symptom severity and parenting depression, anxiety and stress status during COVID-19 pandemic, which have been reported in many studies (Foronda, 2000; Foo et al., 2014; Ilias et al., 2018; Santoso et al., 2015; Chong and Kua, 2016).

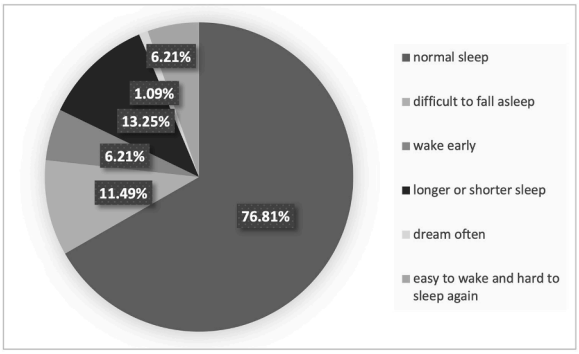

Fig. 1. Sleep status of children and adolescents with ADS and other developmental disorders.

4.2. Differences among mothers, fathers and other caregivers

Though no differences of the depression, anxiety, stress or social support were found among mothers, fathers and other caregivers, the results showed that fathers got more subjective support than mothers and others had more support availability than either mothers or fathers in this study. However, inconsistent conclusions have been found with regards to the mental health levels of mothers and fathers as a couple or separately. For example, some studies showed the increased stress levels of mothers and fathers together as a couple (e.g., Dabrowska and Pisula, 2010; Ingersoll and Hambrick, 2011; Harper et al., 2013), however, others chose to investigate the stress levels among mothers and fathers separately. Herring et al. (2006) found mothers were more greatly affected and they showed higher levels of stress. Rivard, Terroux, Parent-Boursier, and Mercier (2014) reported that fathers had higher levels of stress. Ilias et al (2018) suggested that "a nurturing/emotional theme possibly underlies the factors that affect the stress experienced by mothers, fathers may be more likely to respond to stress based on their role as a provider in the family."

4.3. Correlations with children's age, gender or comorbidities

Children's age, gender or comorbidities were not found significantly related with caregivers' mental health or social support in the current study, however, the child's age may be a moderating variable between child and family characteristics and caregivers' mental health outcomes. As reported by Orr et al (1993), "there was some evidence that the maturational changes that occur in middle childhood combined with children's increased exposure to social situations require major adjustments in parental expectations which, in turn, may be associated with higher risk for stress compared to both early years and adolescence" (Salomone et al., 2018). McStay et al (2014) also suggested that children's behavioral problems (e.g., higher levels of child hyperactivity) could predict higher levels of parenting distress. Some studies also reported that differences in child comorbidities may confound group differences in parental mental health (Griffith et al. 2010; Hartley et al. 2012).

4.4. Correlations with marital status, educational background and household income

The findings showed that caregivers' marital status, their educational background and household income were all significantly related to their social support in this study which confirmed the previous reports, such as, Ilias et al (2018) reviewed that "financial difficulty was a factor that was frequently reported to influence the level of stress experienced among parents of children with ASD (Tait and Mundia, 2012; Ha et al., 2014; Quilendrino et al., 2015) and negatively correlate with levels of parenting stress and depression (Athari et al., 2013)." Goldberg et al (1997) indicated that the mental health of caregivers was not affected by their educational level, however, Salomone et al (2018) reported that the lower the educational level of parents were, the less likely that they had mental health difficulties. This may reflect multiple variables as suggested by Salomone et al (2018) that "under-reporting of symptoms in caregivers with low educational level due to difficulties in verbal comprehension, as highlighted by Kessler and Üstün (2004) or other contextual factors associated with work commitments in highly educated caregivers (Parkes et al. 2015)". Jones and Nicolás (2004) reported that in a general population sample the lower the parental education and income were, the more likely they had the higher rates of common mental health problems and poorer mental well-being.

4.5. Correlations with knowledge of COVID-19

The findings showed that caregivers who had the highest level of fear of COVID-19 showed the highest levels of depression, anxiety and stress, and were not affected by their social support. The result also indicated that caregivers whose children were affected most by COVID-19 demonstrated the highest levels of mental health problems, such as depression, anxiety and stress and the lowest social support, which confirmed the hypothesis.

4.6. Effectiveness of home intervention and online courses

The results demonstrated that caregivers who found home intervention not effective showed the highest levels of mental health difficulties and those who obtained the most social support found home intervention significantly effective. Previous studies have showed that home intervention delivered by caregivers have been reported to be effective (Burrell and Borrego, 2012; Ho and Lin, 2020). Frequency of online courses was not significantly related with mental health of caregivers. However, online courses made up the losses on routine schooling and therapies a little bit, hence, those caregivers whose child had the daily online courses had the most social support.

4.7. Child-parent interaction during COVID-19

In the current study, the child-parent interaction during COVID-19 was found not significantly correlated with mental health of caregivers but those families which had the most child-parent interaction got the most social support. Whitmore (2016) suggested that "caregivers who were under stress were more likely to have disrupted relationships and experience difficulty caring for their child. This can impact the child's functioning and can also put the child at a greater risk for abuse or neglect."

4.8. Limitations

The study had some limitations. Firstly, it lacked the baseline assessment of the caregivers' mental health status and social support conditions, and thus could not conduct the longitudinal analysis of variables. Secondly, given the fact that a number of t tests, Pearson's correlation and regression models were conducted, there may be some potential multiple comparison problems. Thirdly, there were some potential risk factors and protective factors for the mental health problems that were not assessed, such as other negative life events, family conflict, medical illness, adaptive coping strategies and self-efficacy.

5. Conclusion

The findings of this study showed that caregivers' high levels of depression, anxiety and stress may depict the unfulfilled social support. Their mental health problems can be decreased by some psychological and behavioral interventions and programs, stable employment and higher household income, reduced child problematic behaviors, etc.

Declaration of Competing Interest

None.

Data availability statement

All datasets generated for this study are included in the article/supplementary material.

Ethics statement

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committees and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. The studies involving human participants were reviewed and approved the ethics

committee of Nankai University.

Informed consent

Informed consent was obtained from all individual participants included in the current study.

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